

REMARKS

Claims 1-20 are currently pending in the application. In the Office Action dated July 21, 2005 ("Office Action"), the Examiner rejected claims 1-20 under 35 USC § 112, second paragraph, as being indefinite, rejected claims 1 and 4-15 under 35 U.S.C. § 102(e) as being anticipated by Uchara et al., U2002/0040414 A1 ("Uchara"). Applicant has amended claims 1-15 to address the Examiner's 35 USC § 112 rejections, resubmits the previously submitted Rule 131 Affidavit with additional supporting documents, and continues to respectfully submit that Uchara is not a citable reference.

With regard to the Examiner's 35 USC § 112 rejections, Applicant's representative has endeavored to amend the claims to more distinctly point out and clearly claim that which Applicant regards as his invention. Applicant's representative admits to not fully understanding all of the Examiner's objections. For example, Applicant's representative believe that the previously included language referring to direct communication through a single communications medium and to indirect communication through two or more communications media and forwarding nodes was quite clear, unambiguous, and understandable to anyone skilled in computing, networking, and computer and network architectures. The term "direct," in networking, refers to transmitting messages from a transmitting node directly to a receiving node through a single communications medium, such as a bus or an Ethernet, without messages being forwarded through forwarding nodes. The term "indirect," in networking, refers to, for example, transmitting messages from a transmitting node through a first communications medium to a forwarding node, and transmitting the messages from the forwarding node to a receiving node through a second communications medium, such as communications between two nodes on two different Ethernet media bridged by a router or other bridging device or system, or communications over two buses bridged by a bus-bridge device. There are many different possible physical implementations for both direct and indirect communications systems, including transmission by broadcast through space, through copper wires, optical fibers, combinations of copper wire and optical fibers, aluminum, copper, or other conductive signal lines, and many other implementations. Communications also involve protocols and complex devices for encoding and decoding electronic signals. The exact nature of the communications media and

implementations is completely irrelevant to the claimed invention, just as the size, color, and material composition of housings for the claimed system are irrelevant. A claim is not an encyclopedic blueprint for implementing an invention, and need not contain myriad implementation details. Nonetheless, Applicant's representative has again amended the claims in the hope that they are now clearer to the Examiner.

With regard to the previously submitted Rule 131 Affidavit, the Examiner states:

In response to Applicants' argument, the declaration under 36 CFR 1.131 filed 8/10/2004 is insufficient to overcome the rejection of claims 1, 4-15 over Uchara under 35 USC § 102(e) as set forth in the last Office action because it is not properly executed and fails to establish reduction to practice prior to the date of the reference. ... In the affidavit Applicants state that the invention was reduced to practice. However, a written description does not constitute an actual reduction to practice. Furthermore, only the filing of a US patent application which complies with the disclosure requirement of 35 U.S.C. § 112 constitutes a constructive reduction to practice. A written description, no matter how complete, which has not been made the subject of a US patent application does not qualify as reduction to practice. In any event, it is Applicants' acknowledgement that the invention is not built or tested ...

The Examiner does not indicate why the previously submitted Rule 131 Affidavit is not properly executed. It is complete, and signed and dated by the Inventor. In the previously submitted Rule 131 Affidavit, enclosed again for the Examiner's convenience, the Applicant did not state that the invention was reduced to practice. The Applicant stated that he conceived the invention prior to the date of the cited reference, and that, following conception, he diligently pursued a constructive reduction to practice.

The Examiner's statement seems to indicate a misunderstanding of Rule 131 Affidavit practice, and the statutes on which the practice is based. Filing of the Current Application constitutes a constructive reduction to practice. As stated in 35 C.F.R. § 1.131(b):

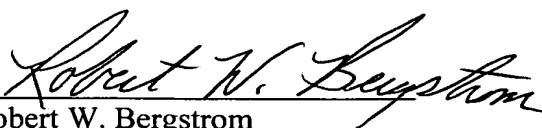
The showing of facts shall be such, in character and weight, as to establish reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective data of the reference coupled with due diligence from prior to said date to a subsequent reduction to practice or to the filing of the application. (emphasis added)

Whether or not the invention was built and tested has no bearing on the establishment of prior invention. Applicant's representative has submitted exhibits, with a new STATEMENT OF FACTS ESTABLISHING DILIGENCE, that, following the invention disclosure dated June 12, 2001, prior to the effective date of the cited reference, Applicant's representative was contacted by the Assignee regarding preparation of the patent application on June 21, 2001, a signed representation agreement was submitted on August 15, 2001, transmittal of a draft of the patent application to the Inventor occurred on September 28, 2001, and a communication from the Assignee concerning signing of the declaration by the Inventor was forwarded on November 2, 2001, three days prior to filing of the Current Application. In short, constructive reduction to practice was diligently pursued by both the Inventor and the Assignee. Applicant's representative requests that the Examiner review 35 C.F.R. § 1.131 and reconsider the enclosed Rule 131 Affidavit, and supporting documents. Uchara is not prior art in view of the Rule 131 Affidavit and supporting documents, and cannot be cited in a 35 § 102(e) rejection of the Current Application.

Finally, Applicant's representative would like to thank the Examiner for the conditional allowance of claims 2, 3, and 16-20, but wishes to defer rewriting those claims in independent form until the Examiner has considered the Rule 131 Affidavit, and current amendments.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,
Debendra Das Sharma
Olympic Patent Works PLLC


Robert W. Bergstrom
Registration No. 39,906

Enclosures:

Postcards (2)
Transmittal in duplicate

Olympic Patent Works PLLC
P.O. Box 4277

Seattle, WA 98194-0277
206.621.1933 telephone
206.621.5302 fax

(Declaration of *Prior Invention* In the United States or in a NAFTA or WTO Member Country to Overcome Cited Patent or Publication—37 C.F.R. § 1.131 [g-32] - page 1 of 4)

NOTE: "When any claim of application or a patent under reexamination is rejected under 35 U.S.C. 102(a) or (e), or 35 U.S.C. 103 based on a U.S. patent to another or others which is prior art under 35 U.S.C. 102(a) or (e) and which substantially shows or describes but does not claim the same patentable invention, as defined in 37 C.F.R. 1.601(n), or a reference to a foreign patent or to a printed publication, the inventor of the subject matter of the rejected claim, the owner of the patent under reexamination, or the party qualified under §§ 1.42, 1.43 or 1.47, may substitute an appropriate oath or declaration to overcome the patent or publication. The oath or declaration must include facts showing a completion of the application in this country or in a NAFTA or WTO member country before the filing date of the application on which the U.S. patent issued, or before the date of the foreign patent, or before the date of the printed publication. When an appropriate oath or declaration is made, the patent or publication cited shall not bar the grant of a patent to the inventor or the confirmation of the patentability of the claims of the patent, unless the date of such patent or printed publication is more than one year prior to the date on which the inventor's or patent owner's application was filed in this country." 37 C.F.R. § 1.131(a)(1).

NOTE: 37 C.F.R. § 1.131 Is not applicable to a rejection based on a U.S. patent that CLAIMS the rejected invention.

2. The person making this declaration is (are):

- ☒ the Inventor(s).
- ☐ only some of the joint inventor(s)
(and a suitable excuse is attached for failure of the omitted joint inventor(s) to sign)
- ☐ the party in interest
(and a suitable explanation as why it is not possible to produce the declaration of the inventor(s) is attached)

FACTS AND DOCUMENTARY EVIDENCE

3.

NOTE: The showing of facts shall be such, in character and weight as to establish reduction to practice prior to the effective date of the reference, or conception of the invention prior to the effective date of the reference coupled with due diligence from prior to said date to a subsequent reduction to practice or to the filing of the application. 37 C.F.R. § 1.131(b).

To establish the date of completion of the invention of this application, the following attached documents and/or models are submitted as evidence:

(check all applicable items below)

- ☐ sketches
- ☐ blueprints
- ☐ photographs
- ☐ reproduction(s) of notebook entries
- ☒ Disclosure
- ☐ supporting statement(s) by witness(es) (where verbal disclosures are the evidence, relied upon)

NOTE: While conception is the mental part of the inventive act, it must be capable of proof, such as by demonstrative evidence or by complete disclosure to another. Conception is more than a vague idea of how to solve a problem. The requisite means themselves and their interaction must also be comprehended. See *Margenthaler v. Scudder* 1897 C.D. 724, 81 O.G. 1417. See also M.P.E.P. § 715.07 and § 2138.04, 7th ed.

(Declaration of Prior Invention in the United States or in a NAFTA or WTO Member Country to Overcome Cited Patent or Publication—37 C.F.R. § 1.131 [g-32]—page 2 of 4)

From these documents and/or models, it can be seen that the invention in this application was made

on _____
X at least by the date of June 11, 2001 which is a date earlier than the effective date of the reference.

NOTE: "If the dates of the exhibits have been removed or blocked off, the matter of dates can be taken care of in the body of the oath or declaration." M.P.E.P. § 715.07, 7th ed.

NOTE: "[T]he dates in the oath or declaration may be the actual dates, or, if the applicant or patent owner does not desire to disclose his or her actual dates, he or she may merely allege that the acts referred to occurred prior to a specified date." M.P.E.P. § 715.07, 7th ed.

DILIGENCE

NOTE: "Where there has not been reduction to practice prior to the date of the reference, the applicant or patent owner must also show diligence in the completion of his or her invention from a time just prior to the date of the reference continuously up to the date of the actual reduction to practice or up to the date of filing his or her application (filing constitutes a constructive reduction to practice, § 1.131). "M.P.E.P. § 715.07, 6th ed., rev. 3 (emphasis added).

NOTE: "A conception of an invention, though evidenced by disclosure, drawings, and even a model, is not a complete invention under the patent laws, and confers no rights on a inventor, and has no effect on a subsequently granted patent to another, UNLESS HE OR SHE FOLLOWS IT WITH REASONABLE DILIGENCE BY SOME OTHER ACT, such as an actual reduction to practice or filing an application for a patent. *Automatic Weighing Mach. Co v. Pneumatic Scale Corp., Limited* 1909 C.D. 498, 139 O.G. 991, M.P.E.P. § 715.07, 7th ed.

"Conception in the mental part of the inventive act, but it must be capable of proof, as by drawings, complete disclosure to another person, etc., In *Mergenthaler v. Scudder*, 1897 ca 724, 81 O.G. 1417, it was established that conception is more than a mere vague idea of how to solve a problem; the means themselves and their interaction must be comprehended also." M.P.E.P. § 715.07, 7th ed.

NOTE: Only diligence before reduction to practice is a material consideration. The "lapse of time between the completion or reduction to practice of an invention and the filing of an application thereon." (*Ex parte Merz* 74 U.S.P.Q. 296) is not relevant to an affidavit or declaration under 37 C.F.R. § 1.131. M.P.E.P. § 715.07(a), 7th ed.

Attached is a statement establishing the diligence of the applicants, from the time of their conception, to a time just prior to the date of the reference, up to the:

___ actual reduction to practice.
X filing of this application.

TIME OF PRESENTATION OF THE DECLARATION

(complete (a), (b) or (c))

- (a) X This declaration is submitted prior to final rejection.
- (b) ___ This declaration is submitted with the first response after final rejection, and is for the purpose of overcoming a new ground of rejection or requirement made in the final rejection.
- (c) ___ This declaration is submitted after final rejection. A showing under 37 C.F.R. § 1.116(b) is submitted herewith.

(Declaration of Prior Invention In the United States or In a NAFTA or WTO Member Country to Overcome Cited Patent or Publication—37 C.F.R. § 1.131 [9-32]—page 3 of 4)

DECLARATION**6. As a person signing below:**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on Information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)**7.***(complete A or 8 below)***A. Inventor(s)**Full name of sole or first inventor Debendra Das SharmaInventor's signature Debendra Das SharmaDate 8/4/04 Country of Citizenship IndiaResidence 2043 ACACIA CTPost Office Address SANTA CLARA, CA 95050

Full name of second joint inventor, if any _____

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____

Full name of third joint inventor, if any _____

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____

(use added page for signature by additional inventors)

Number of pages added: _____

(Declaration, of Prior Invention In the United States, or In a NAFTA or WTO Member Country to Overcome
Cited Patent or Publication—37 C.F.R. § 1.151 [g-32] page 4 of 4)



PATENT

I hereby certify that on the date specified below, this correspondence is being deposited with the United States Postal Service as Express mail in an envelope addressed to Mail Stop Amendment Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date

9/21/05

Robert Bergstrom

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Debendra Das Sharma
Application No. : 10/011,857
Filed : November 5, 2001
For : Method and System for Controlling Flow of Ordered, Pipelined Transactions between Intercommunicating Electronic Devices

Examiner : Khanh Dang
Art Unit : 2111
Docket No. : 10017812-1
Date : September 21, 2005

MAIL STOPAMENDMENT
Commissioner for Patents
Washington, DC 20231

STATEMENT OF FACTS ESTABLISHING DILIGENCE RE 37 C.F.R. § 1.131

Sir:

I hereby provide a copy of the original invention disclosure, received by the Assignee on June 12, 2001, and signed by the inventor on June 8, 2001, which establishes conception of the invention claimed in claims 1-20 of the above-identified patent application. I also provide a letter from the client dated June 21, 2001; a Request for Quote and Engagement Letter Agreement Form executed August 15, 2001; a return Request for Quote and Engagement Letter Agreement Form executed August 20, 2001; email dated August 29, 2001; facsimile to the inventor dated September 28, 2001; and a letter from the client dated November 2, 2001 which

establish diligence in constructively reducing this invention to practice from a time just prior to the date of the disclosure continuously up to the date of the filing of this application.

EXHIBIT 1 - letter from the client dated June 21, 2001;

EXHIBIT 2 - Request for Quote and Engagement Letter Agreement Form
executed August 15, 2001;

EXHIBIT 3 - return Request for Quote and Engagement Letter Agreement
Form executed August 20, 2001;

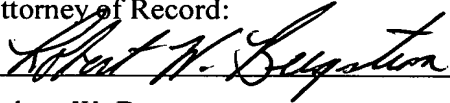
EXHIBIT 4 - email dated August 29, 2001;

EXHIBIT 5 - facsimile to the inventor dated September 28, 2001; and

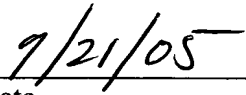
EXHIBIT 6 - letter from the client dated November 2, 2001

EXHIBIT 7 – copy of the disclosure

Attorney of Record:



Robert W. Bergstrom



Date



Hewlett-Packard Company
19111 Pruneridge Avenue
mail stop 44L18
Cupertino, CA 95014-0795
www.hp.com

Dave M. Mason
Senior Patent Agent
IP Section, Legal Department

408.447.4046 Tel
408.447.0854 Fax
dave_mason@hp.com

21 June 2001

Robert W. Bergstrom
Weiss, Jensen, Ellis & Howard
2600 Pike Tower
520 Pike Street
Seattle, WA 98101

Re: Request for Quote
HP PDNO: 10017812-1
Title: Enforcing Ordering For Retried Pipelined Transactions
Inventor(s): Debendra Das Sharma

Dear Mr. Bergstrom:

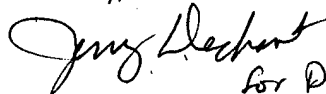
Please give us a quote of the cost to perform the services indicated on the attached *Request for Quote and Engagement Letter Agreement* (herein after "RFQ") form, for the above-identified matter, pursuant to Outside Counsel Procedures revised October 15, 1999, a copy of which you have received and reviewed. The quote should be based on your preparing and providing the requested services by the date for receipt by HP and/or the USPTO as indicated.

Your quote should be submitted on the enclosed RFQ form. If we accept your quote, we will return a fully executed copy of the Agreement to you for your records. The Agreement will not be binding on you or HP until signed by HP's authorized representative(s).

If the Agreement is not signed and returned to HP, any bills submitted by you cannot be paid.

Thank you for your assistance. If performing these services might involve a possible conflict of interest for your firm, you should advise us within one week of receipt of this letter.

Sincerely,


for Dave Mason

Dave M. Mason
Senior Patent Agent

DMM/jd
enclosure(s)

EXHIBIT 1

Date: 2 March 2001

US PTO Ser. No.: not yet assigned

- Prepare:
- ☒ US PTO Original Patent Application to be
 - ☐ US PTO Office Action Response to be
 - ☐ Other: _____
 - ☐ Returned to HP for filing
 - ☒ Filed out of your office to the US PTO

EXHIBIT 2

REQUEST FOR QUOTE AND ENGAGEMENT LETTER AGREEMENT FORM

Date: 2 March 2001RE: HP PDNO: 10017812-1US PTO Ser. No.: not yet assigned☒ This is a REQUEST FOR QUOTE (RFQ) for the following services:☒ This is NOW the ENGAGEMENT LETTER AGREEMENT (ELA) of your quote for the following services:

Prepare:

☒ US PTO Original Patent Application to be☐ US PTO Office Action Response to be☐ Other: _☐ Returned to HP for filing☒ Filed out of your office to the US PTO

YOUR FINISHED PRODUCT TO HP SHOULD INCLUDE ALL ITEMS ACCORDING TO THE ENCLOSED CHECKLIST.

HP's Required Due Date: See special instructions (Date for receipt by HP or date to be filed to the US PTO if that is indicated above)HP's Primary Technical Contact: Debendra Das Sharma
Address: Hewlett-Packard Company
1000 Wolfe Road, m/s 42LAB
Cupertino, CA 95014Telephone No.: 408 447-0978 FAX No.: _

ADDITIONAL TERMS OR INSTRUCTIONS:

Please do a patent search prior to drafting this application communicating the results by September 7, 2001. If so directed proceed with filing this application to the USPTO on or before November 7, 2001. Please obtain the inventor's signature on the Declaration & Power of Attorney document and the Assignment of Patent Application document prior to filing this application. Please note the inventor does not need to have his signature notarized on the assignment. ALSO: When communicating with our office regarding this application address it to Dave Mason/Jerry Dechant.

TOTAL QUOTE PRICE (including Formal Drawings): _____

If this Agreement is not signed and returned to HP, any bills submitted by you cannot be paid.

I agree to the terms of this Agreement including the additional terms above, pursuant to the HP Procedures for Outside Counsel revised October 15, 1999, a copy of which I have received and reviewed. This Agreement will not be binding on either party until signed by an authorized representative of Hewlett-Packard Company.

SUMMIT LAW GROUP
Weiss, Jensen, Ellis & Howardby: Robert W. Bergstrom

Robert W. Bergstrom

HEWLETT-PACKARD COMPANY

by: Dave M. Mason

Dave M. Mason

Date: Aug - 15, 2001Date: 8/26/01

EXHIBIT 3

Joanne Bourguignon

From: Bob Bergstrom
Sent: Wednesday, August 29, 2001 2:52 PM
To: Joanne Bourguignon
Subject: FW: CSL Application

Looks like we change the due date to September 24

-----Original Message-----

From: PLETTNER, DAVID (HP-Cupertino,ex1) [mailto:david_plettner@hp.com]
Sent: Wednesday, August 29, 2001 2:32 PM
To: 'Robert Bergstrom (bobb@summitlaw.com)'
Cc: MASON, DAVE (HP-Cupertino,ex1); DECHANT, JERRY (HP-Cupertino,ex1)
Subject: CSL Application

Hello Bob,

I am the HP Patent Attorney responsible for CSL in Cupertino. Dave Mason sent you a disclosure from this entity, HP PDNO 10017812, with a due date of November 7, 2001.

I just wanted to let you know that HP has sold the CSL entity to Intel. The inventors will remain HP employees until September 21, and will become Intel employees on September 24. HP will pay patent incentive awards to these inventors after they have left HP, so you should be able to obtain the inventor's assistance. However, please be aware that obtaining assistance from the inventors will probably be easier before September 24.

Feel free to contact me or Dave Mason if you have any questions or concerns.

Regards,
David Plettner
Corporate Counsel
Hewlett-Packard Legal Department - Cupertino
(408) 447-3013

SUMMIT LAW GROUP

a professional limited liability company

1505 Westlake Avenue North, Suite 300
Seattle, Washington 98109-3050
Phone: (206) 676-7098
Fax: (206) 676-7099

FAX TRANSMISSION COVER SHEET

THE INFORMATION CONTAINED IN THIS COMMUNICATION IS INTENDED ONLY FOR THE USE OF THE ADDRESSEE AND MAY BE CONFIDENTIAL, MAY BE PROTECTED BY THE ATTORNEY-CLIENT PRIVILEGE AND MAY CONSTITUTE INSIDE INFORMATION. UNAUTHORIZED USE, DISCLOSURE OR COPYING IS STRICTLY PROHIBITED, AND MAY BE UNLAWFUL. IF YOU HAVE RECEIVED THIS COMMUNICATION IN ERROR, PLEASE IMMEDIATELY NOTIFY ME AT (206) 676-7098.

FROM: Joanne Bourguignon

DATE: September 28, 2001
HP Ref. No. 10017812
Our Ref. No. 35000.00108

TOTAL PAGES TO BE SENT (including this cover sheet): 54

SEND TO:

NAME	COMPANY	TELEPHONE	FAX
Debendra Das Sharma		408.765.2090	408.653.5233

Debendra, as we discussed, please find attached the patent application, drawings and signatory documents for the above-identified HP matter.

Once you have had an opportunity to review the application, please email or call Bob with your questions and comments.

Please review, sign and date the Declaration and Power of Attorney and Assignment documents (note: the Assignment must be notarized). Upon execution, you may fax the documents to me at 206.676.7099. Please then mail me the original signed documents so they may be retained in the file, should their authenticity ever be brought into question.

If you have any questions, please feel free to call me at 206.676.7098.

Joanne Bourguignon
IP Paralegal

EXHIBIT 5



Hewlett-Packard Company
19111 Pruneridge Avenue
mail stop 44L18
Cupertino, CA 95014-0795
www.hp.com

Dave M. Mason
Senior Patent Agent
IP Section, Legal Department

408.447.4046 Tel
408.447.0854 Fax
dave_mason@hp.com

2 November 2001

Robert W. Bergstrom
Summit Law Group
1505 Westlake Avenue North, Suite 300
Seattle, WA 98109-3050


Re: Signed Declaration for HP PDNO: 10017812-1

Dear Mr. Bergstrom:

Debendra Das Sharma came by our office this morning and signed both the Declaration and Assignment documents. I am returning the Declaration document to you for filing with the application. I will maintain the Assignment document for future filing from our office.

If you have further questions or concerns regarding this matter, please contact me.

Sincerely,


Dave M. Mason *for Dave Mason.*
Patent Agent

DMM/jd

enclosure(s)

EXHIBIT 6

PDNO 10017812

DATE RCVD 6-12-01

PAGE ONE OF 4

ATTORNEY DAP

Instructions: The information contained in this document is COMPANY CONFIDENTIAL and may not be disclosed to others without prior authorization. Submit this disclosure to the HP Legal Department as soon as possible. No patent protection is possible until a patent application is authorized, prepared, and submitted to the Government.

Descriptive Title of Invention:

Enforcing ordering for retried pipelined transactions

Name of Project:

shangaila

Product Name or Number:

RECEIVED

JUN 12 2001

Was a description of the invention published, or are you planning to publish? If so, the date(s) and publication(s):

NO

HP LEGAL DEPT.
CUPERTINO, CA.

Was a product including the invention announced, offered for sale, sold, or is such activity proposed? If so, the date(s) and location(s):

NO

Was the invention disclosed to anyone outside of HP, or will such disclosure occur? If so, the date(s) and name(s):

Disclosed to Intel under CDA.

If any of the above situations will occur within 3 months, call your IP attorney or the Legal Department now at 1-898-4919 or 970-898-4919.

Was the invention described in a lab book or other record? If so, please identify (lab book #, etc.)

Was the invention built or tested? If so, the date:

not yet

Was this invention made under a government contract? If so, the agency and contract number:

NO

Description of Invention: Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).

- A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).
- B. Problems solved by the invention.
- C. Advantages of the invention over what has been done before.
- D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

Signature of Inventor(s): Pursuant to my (our) employment agreement, I (we) submit this disclosure on this date: [6/8/01].

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name
358146	DEBENDRA DAS SHARMA	Debendra Das Sharma	447-0978	42LAB	47CL-2501 (SL/SVR)

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name

Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name

(If more than four inventors, include additional information on another copy of this form and attach to this document)

Signature of Witness(es): (Please try to obtain the signature of the person(s) to whom invention was first disclosed.)
The invention was first explained to, and understood by, me (us) on this date: []

PAGE 1 OF 4

Full Name

ASHISH GUPTA

Signature

[Signature]

Date of Signature

6/11/2001

Full Name

Signature

Date of Signature

Inventor & Home Address Information: (If more than four inventors, include addl. information on a copy of this form & attach to this document)

Inventor's Full Name

DEBENDRA DAS SHARMA

Street

2043 ACACIA CT

City

SANTA CLARA

State

Zip

Do you have a Residential P.O. Address? P.O. BOX

CA

95050

City

State

Zip

Greeted as (nickname, middle name, etc.)

DEBENDRA

Citizenship

INDIA

Inventor's Full Name

Street

City

State

Zip

Do you have a Residential P.O. Address? P.O. BOX

City

State

Zip

Greeted as (nickname, middle name, etc.)

Citizenship

Inventor's Full Name

Street

City

State

Zip

Do you have a Residential P.O. Address? P.O. BOX

City

State

Zip

Greeted as (nickname, middle name, etc.)

Citizenship

Inventor's Full Name

Street

City

State

Zip

Do you have a Residential P.O. Address? P.O. BOX

City

State

Zip

Greeted as (nickname, middle name, etc.)

Citizenship

(8 Jun 01)

programmed
i/o transfer

1

Enforcing ordering for retried pipelined transactions

A. Problems solved by the invention

Sometimes enforcing ordering between transactions in a computer system becomes necessary. A good example of this is PIO transactions. PIO Writes coming from a processor should not get out of order for the programming model to work. Processors normally pipeline PIO Writes (issue subsequent PIO Writes without getting the commit for the earlier PIOs) for improved performance. It is left up to the chips in the interconnection network to guarantee that they be delivered in order. Another requirement is the capability to retry (or nack) the transaction if there is not enough resources to serve the transaction request instead of blocking the queue and letting other transactions suffer. The disclosure solves the problem of enforcing ordering for pipelined transactions when they may be retried.

B. Prior solutions and their disadvantages

Prior solutions had relied on not retrying the pipelined transactions that had ordering requirements. For example, coherent transactions were designed at the protocol level not have any transaction level ordering requirements. They can be retried at the service node. PIO transactions had transaction level ordering requirements. They were not retried even if it meant performance and quality of service issues. A second alternative is to allow only one ordered transaction to be outstanding per source node. That way the destination can retry the transaction without having to worry about getting transactions out of order. This has a negative performance impact since we are single threading ordered transactions, resulting in higher latency and lower throughput / bandwidth.

C. Description of the construction and operation of the invention

The proposed solution is to have a retry bit vector in the destination node that retries. Each bit in the vector corresponds to a source node that can send a transaction. Once set, the bit indicates that the source node has been retried for the ordered transactions in that particular flow-control class. ~~There needs to be one set of vector for each flow control class where we~~ will allow pipelined ordered transactions to be retried. The ~~retry bit vector powers on as reset ('0')~~. When the destination node retries an ordered transaction, it sets the retry bit ('1'). From that time on, it simply retries every ordered transaction in the same flow control class that is sourced by the node that got retried. When the source gets the retry response, it starts to resend every transaction from the retried transaction onwards (since they are going to be retried anyway). The first retried transaction will have a special bit set in the header to indicate to the destination that this is the first transaction that was retried. When the destination receives, this specially marked transaction, it either accepts it (if it has the resources to deal with the transaction) or retries it again. If it accepts the transaction, it resets the corresponding bit in the retry bit vector.

Once the source node receives the first retry an ordered transaction, it expects to get a retry for every subsequent transaction. It does not take any action for the subsequent retries. However, if a subsequent transaction (that was present when the first retry was received) got retried twice, it means that the destination must have set the retry bit after accepting the first retried transaction. It needs to put the special marker on this transaction and resend all transactions from that transaction onwards. If the first retried transaction got retried, it means that the destination is still rejecting its transaction and it will send all the transactions again overall. The following flowchart demonstrates how the scheme works.

There may be some variants to this scheme. For example, the destination node need not retry subsequent transactions after it has retried the first transaction. It may simply drop all subsequent ordered transactions from the same source till the original retried transaction (identified by the special marker in header) is accepted. The source is aware of this and does not expect to receive any acknowledge for ordered transactions subsequent to the retried one. It may also be possible that the proposed scheme works for an unordered fabric, although the unordered fabric should have enough mechanisms of its own to guarantee ordering when it matters.

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Enforcing ordering for retried pipelined transactions. page 3 of 4

Signature of Inventor(s): I (we) this date, 6/8/01, submit this invention disclosure pursuant to my (our) employment agreement.
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Signature of Witness(es): The invention was first explained to and understood by me on _____
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Witness: name: Ashish Gupta sign: [Signature] date: 6/11/2001

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